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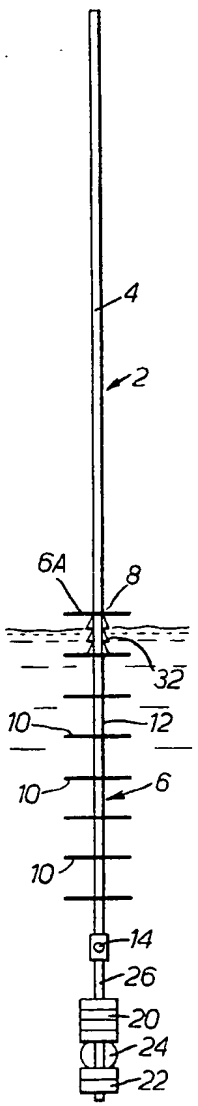
(12) UK Patent Application (19) GB (11) 2 031 361 A

(21) Application No 7840863
(22) Date of filing 14 Oct 1978
(23) Claims filed 10 Jul 1979
(23) Claims filed 28 Aug 1979
(43) Application published
23 Apr 1980
(51) INT CL³
B63B 35/02
(52) Domestic classification
B7V HS
(56) Documents cited
GB 1490870
GB 1362865
GB 1281285
US 3660807A
(58) Field of search
B7V
(71) Applicant
The Plessey Company Limited, Vicarage Lane, Ilford, Essex
(72) Inventor
T. I. Silvey
(74) Agent
G. H. Jones

(54) Hydrodynamic Devices

(57) A hydrodynamic device 2 comprising first and second parts 4, 6 which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrofoil elements 10, and (b) towing means 14 for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

FIG. 2.



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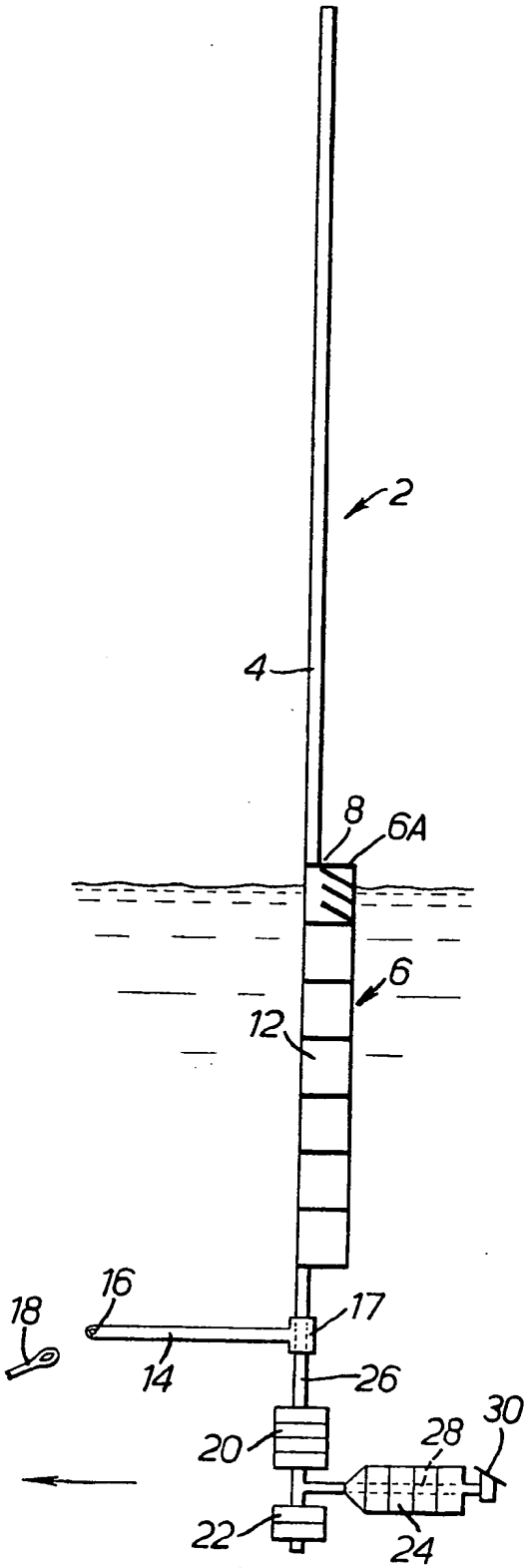


FIG. 1.

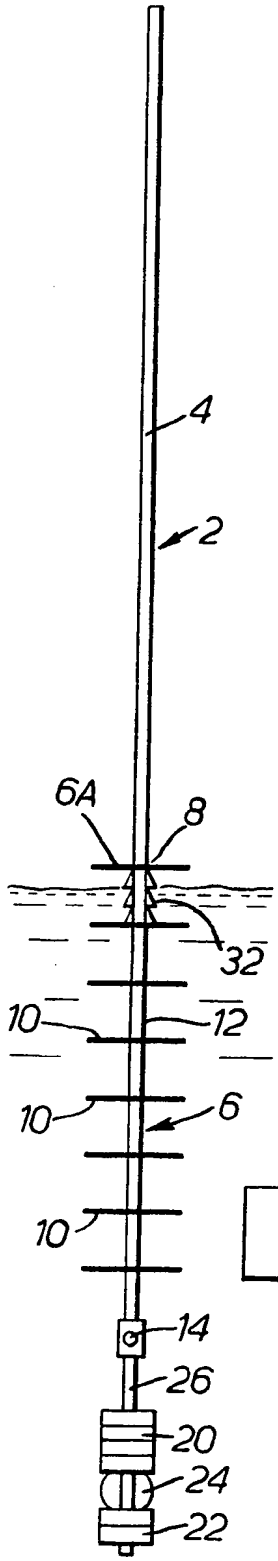


FIG. 2.



FIG. 4.

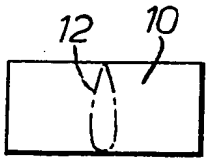


FIG. 3.

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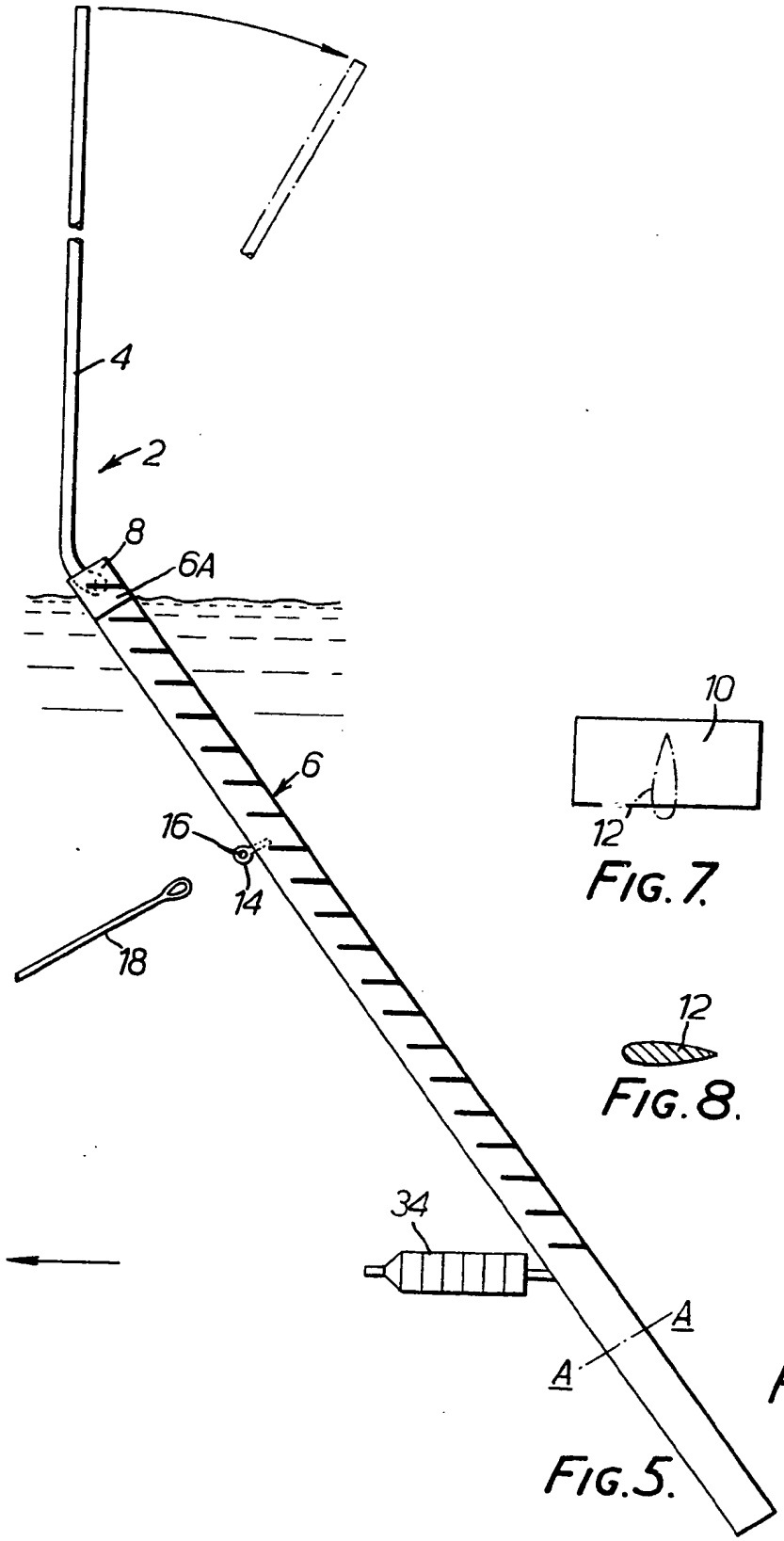


FIG. 5.

FIG. 7.

FIG. 8.

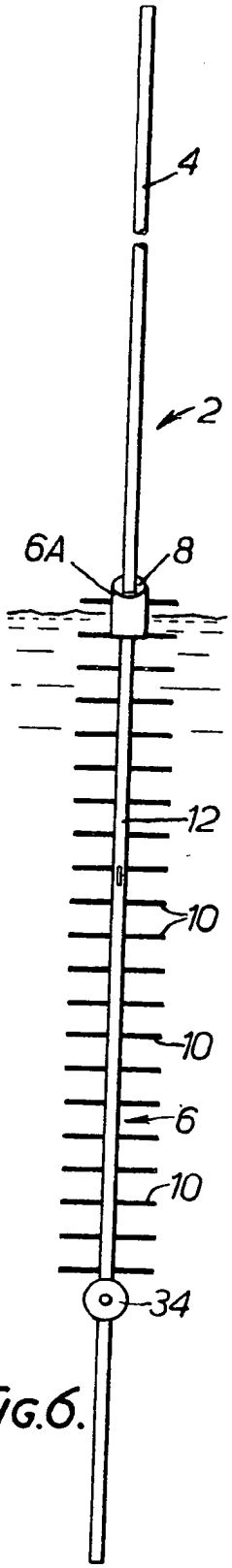


FIG. 6.

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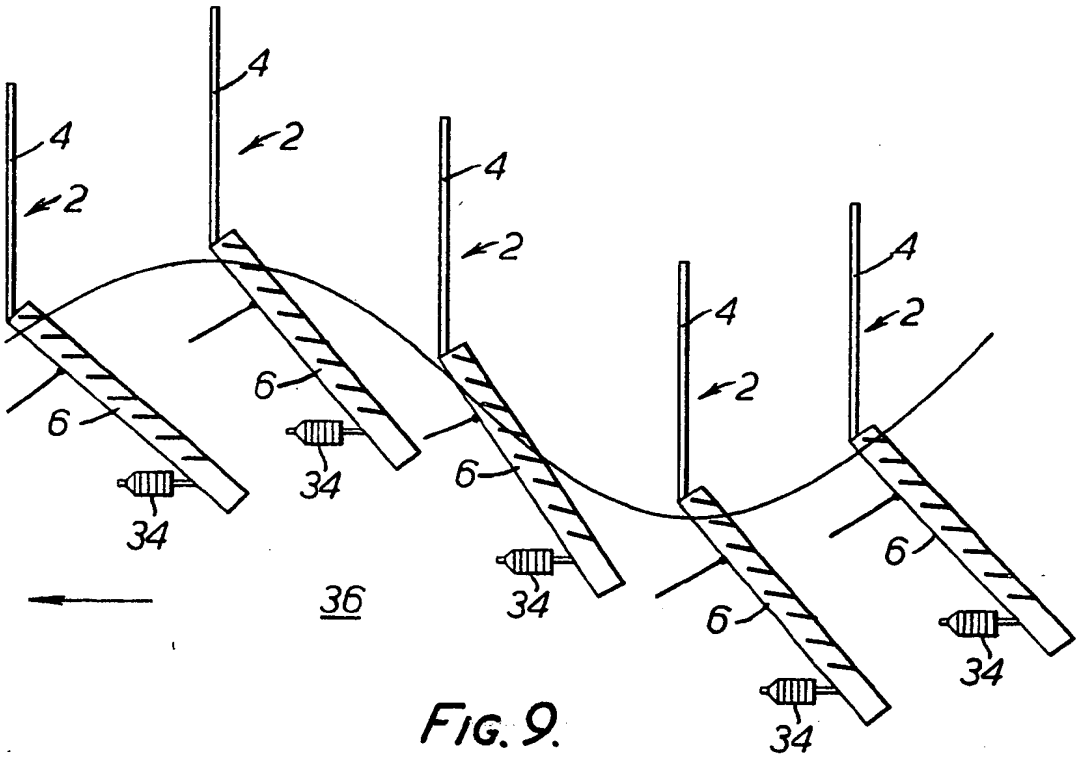


FIG. 9.

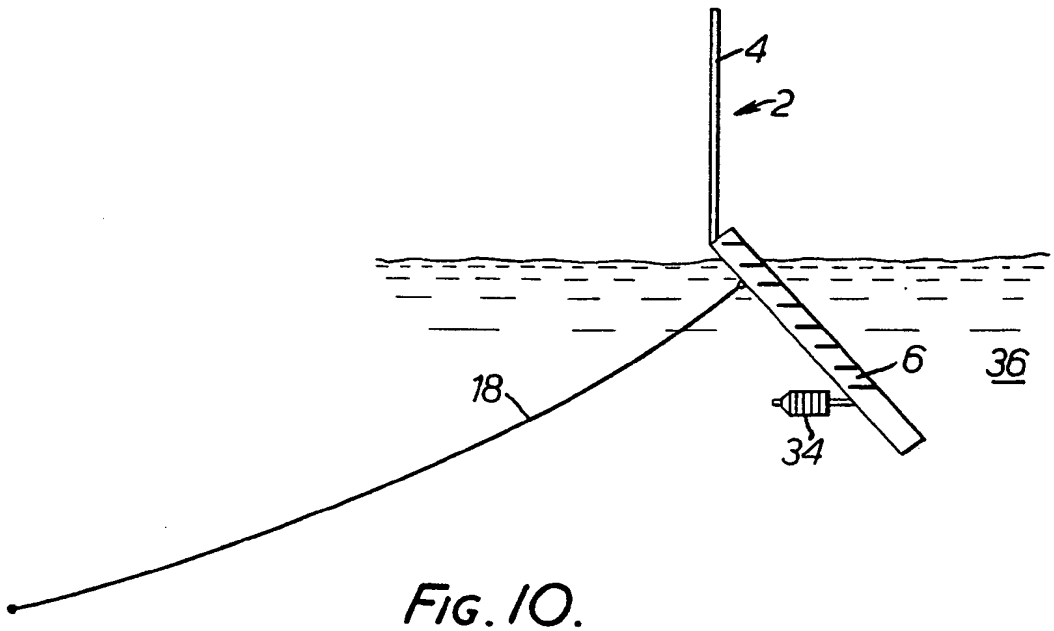


FIG. 10.

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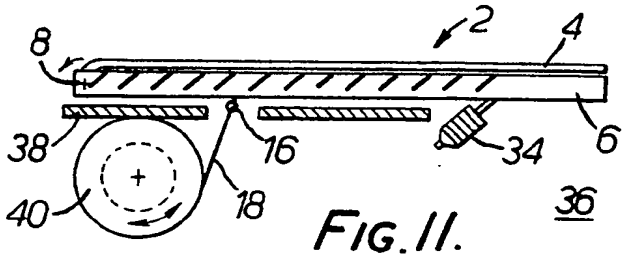


FIG. 11.

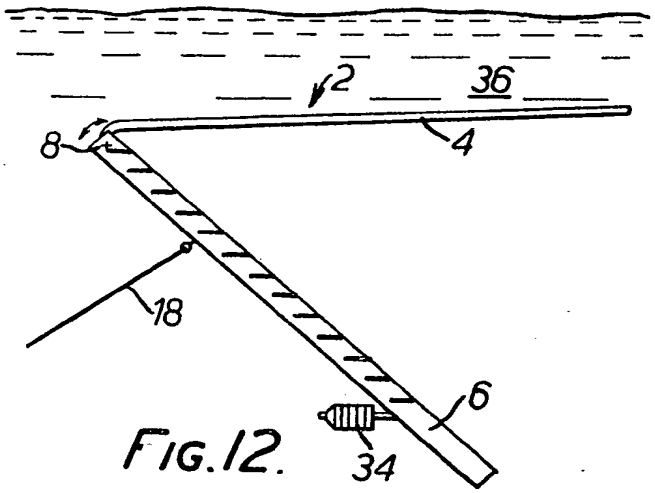


FIG. 12.

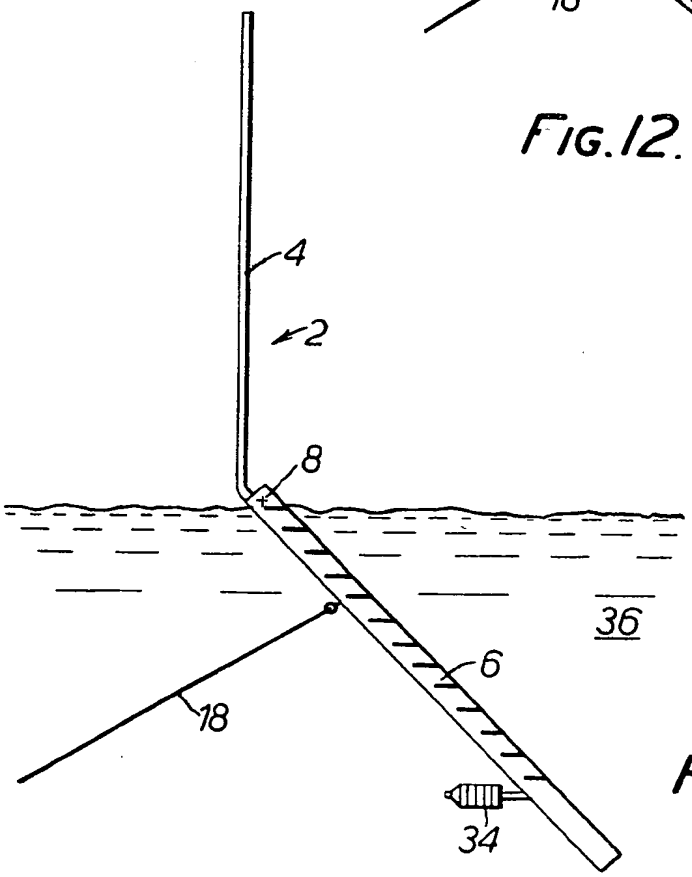


FIG. 13.

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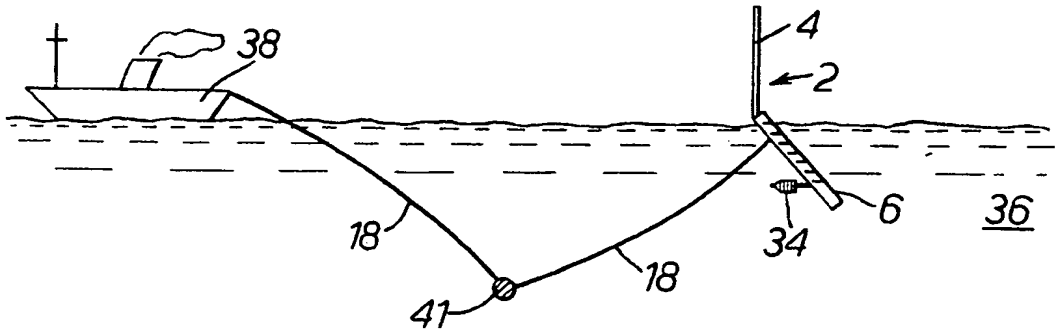


FIG. 14.

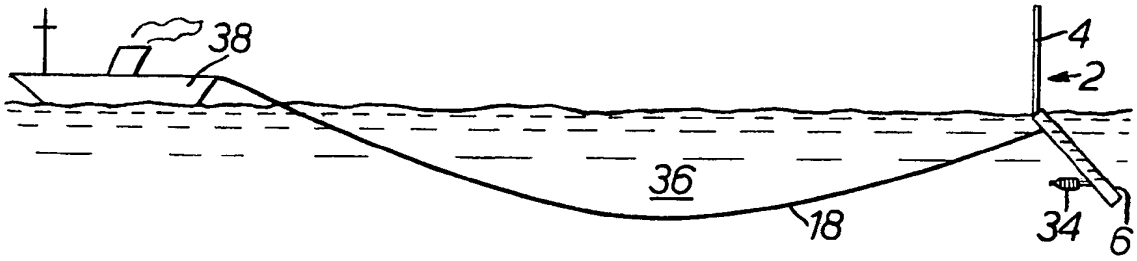


FIG. 15.

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SPECIFICATION

Hydrodynamic Devices

This invention relates to a hydrodynamic device.

More specifically, this invention relates to a hydrodynamic device comprising first and second parts which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrofoil elements, and (b) towing means for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

The hydrodynamic device of the invention is designed so that it can be towed through the water without creating much wake. The hydrodynamic device is also designed to be vertically stable in use so that it can operate in high sea conditions. The device is non-buoyant in water and its characteristics are controlled by its second part which is thus hydrodynamically more important than its first part.

Preferably, the first and second parts are connected together by a sprung hinge arrangement. Such an arrangement allows the first part to easily and automatically move from its stored position to its upstanding operable position. Alternative arrangements for connecting the first and second parts together include a simple pivot whereby the first part can be moved from its stored position to its upstanding position merely by the use of appropriate hydrodynamic and aerodynamic vanes or by a counter balance weight system.

Advantageously, the first and second parts are so connected together that the first part lies substantially exactly flat. In order to achieve this, the precise arrangement by which the first and second parts are connected together may include auxiliary means such for example as a push rod which engages on a storage platform for getting the first part in the desired substantially flat condition.

Preferably, the hydrofoil elements are spaced apart by spacer elements.

The pair of hydrofoil elements that are uppermost when the device is being towed through the water may be provided with drag vanes for controlling the depth at which the second part is submerged. The drag vanes make the hydrodynamic device very sensitive to small depth variations.

Preferably, the towing means is a towing eye but it is to be appreciated that other devices can be employed.

The first part may be constituted by an aerial, a marker, a target or a radar reflector.

The hydrodynamic device may include weighting means, for example positioned on the end portion of the second part that is remote from the first part, for stabilizing the hydrodynamic device and for causing it to tow in a vertical or an inclided position.

Embodiments of the invention will now be described solely by way of example and with reference to the accompanying drawings in which:

Figure 1 is a side view of a first hydrodynamic device in accordance with the invention;

Figure 2 is an end view of the device shown in Figure 1;

Figures 3 and 4 show detailed parts of the device shown in Figure 1;

Figure 5 is a side view of a second hydrodynamic device in accordance with the invention;

Figure 6 is an end view of the device shown in Figure 5;

Figures 7 and 8 show detailed parts of the device shown in Figure 5;

Figures 9 and 10 show the device somewhat schematically as it is being towed through water;

Figure 11 shows the device of Figure 5 in a stowed position;

Figure 12 shows the device of Figure 5 in a partially open position;

Figure 13 shows the device of Figure 5 in its fully expanded position; and

Figures 14 and 15 show two methods of towing the hydrodynamic device illustrated in Figure 5.

Referring to Figures 1 to 4, there is shown a hydrodynamic device 2 comprising a first part 4 in the form of a flexible aerial, and a second part 6. The first and second parts 4, 6 are connected together by a hinge arrangement located at position 8, the hinge arrangement being such that the first part 4 is movable from a storage position in which it lies adjacent to the second part 6 to an operable position in which it upstands from and extends from an end portion 6A of the second part 6.

The second part 6 comprises an elongate member having a plurality of transversely extending hydrofoil elements 10 positioned on a shaped elongate fairing member 12 which reacts with the water flow in a manner which gives the device vertical stability. The second part 6 further comprises towing means in the form of a tow bar 14 for enabling a connection to be made between the hydrodynamic device 2 and a towing vessel (not shown) whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged. The tow bar 14 is provided at one end with a towing eye 16 for receiving a tow line 18 and at the other end a pivot 17 allowing freedom of rotation of the tow bar 14 about a shaft 26 in the elongate member.

Positioned beneath the tow bar 14 are a plurality of weights 20, 22, 24 which are attached to the shaft 26 and which are effective to balance the hydrodynamic device 2. Positioned aft of the

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weight 24 and on a shaft 28 is a rectangular damper plate 30.

As shown most clearly in Figure 2, three drag vanes 32 are provided between the two uppermost hydrofoil elements 10. These drag vanes 32 are effective to control the depth at which the second part 6 is submerged. The drag vanes 32 make the hydrodynamic device 2 very sensitive to small depth variations, such that it can follow water surface wave profiles.

Referring now to Figures 5 to 8, similar parts as in Figures 1 to 4 have been given the same reference numeral and their construction and operation will not again be given in order to avoid undue repetition of description.

It will be noted that the hydrodynamic device 2 illustrated in Figures 5 to 8 has a smaller tow bar 14 than in the hydrodynamic device 2 illustrated in Figures 1 to 4 and that the tow bar pivot 17 is no longer required. Also, in the hydrodynamic device 2 illustrated in Figures 5 to 8, only a single weight 34 is employed and there are no drag vanes 32 or damper plate 30.

In Figure 9, there are shown a plurality of the hydrodynamic devices 2 illustrated in Figures 5 to 8, these devices 2 being illustrated as they follow the wave profile of the sea 36.

In Figure 10, the hydrodynamic device 2 is shown attached to a 50 foot tow line 18 and the depth of tow can vary from 0 to 20 feet. The speed of tow can vary, depending upon the structural strength of the device 2, from 3 to 20 knots for example.

In Figure 11, the hydrodynamic device 2 illustrated in Figures 5 to 8 is shown in its stored position in which the first part 4 is lying adjacent the second part 6. The second part 6 is in fact stored on a platform 38 and the tow line 18 is wound around a winch drum 40. As the cable 18 is unwound from the drum 40, then the hydrodynamic device 2 unfolds as illustrated in Figures 12 and 13, Figure 12 illustrating an intermediate unfolded position and Figure 13 illustrating the fully unfolded position. The platform 38 can be submerged so that the hydrodynamic device 2 can be launched substantially automatically from a submerged condition.

Referring now to Figures 14 and 15, the hydrodynamic device 2 illustrated in Figures 5 to 8 is shown being towed by a vessel 38. In Figure 14, a sinker or depressor device 40 is attached to the tow line 18 so that the device is much closer to the vessel in Figure 14 than in Figure 15 where the sinker or depressor device 41 is not employed.

It is to be appreciated that the embodiments of the invention described above have been given by way of example only and that modifications may be effected. Thus, for example, the weighting arrangements 20, 22, 24 or 34 can be built into the second part 6 to form a part of the second part 6. Also, the first part 4 of the hydrodynamic device 2 has been illustrated as a flexible aerial but this first part 4 of the hydrodynamic device 2 could also be a marker device, a target or a radar reflector. Also, different types of hinge 8 can be employed. If the first part 4 is small than a rigid attachment to part 6 such that it becomes merely an extension to the top of the main part 6 could be envisaged.

Claims

1. A hydrodynamic device comprising first and second parts which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrfoil elements, and (b) towing means for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

2. A hydrodynamic device according to claim 1 in which the first and second parts are connected together by a sprung hinge arrangement.

3. A hydrodynamic device according to claim 1 or claim 2 in which the first and second parts are so connected together that the first part lies substantially exactly flat.

4. A hydrodynamic device according to any one of the preceding claims in which the hydrofoil elements are spaced apart by spacer elements.

5. A hydrodynamic device according to any one of the preceding claims in which the pair of hydrofoil elements that are uppermost when the device is being towed through the water are provided with drag vanes for controlling the depth at which the second part is submerged.

6. A hydrodynamic device according to any one of the preceding claims in which the towing means is a towing eye.

7. A hydrodynamic device according to any on of the preceding claims including weighting means for stabilizing the hydrodynamic device and for causing it to tow in a vertical or an inclined position.

8. A hydrodynamic device according to claim 7 in which the weighting means is positioned on the end portion of the second part that is remote from the first part.

9. A hydrodynamic device substantially as herein described with reference to the accompanying drawings.

New claims or amendments to claims filed on 28/8/79.
Superseded claims 1.

New or Amended Claims:—1

"hydrfoil" on line 9 of claim 1 should read "hydrofoil"

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

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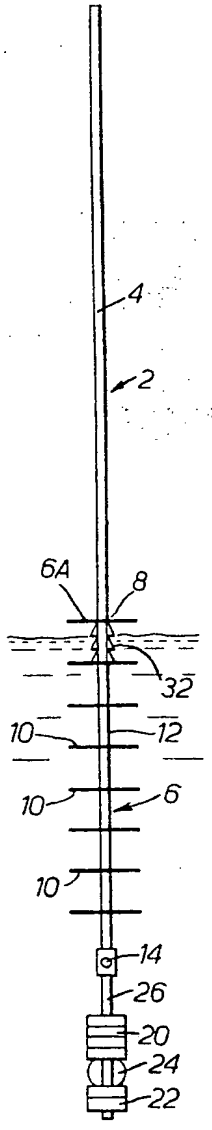
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(51) INT CL³ B63B 35/02
(52) Domestic classification B7V HS
(56) Documents cited
GB 1490870
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GB 1281285
US 3660807A
(58) Field of search B7V
(71) Applicant
The Plessey Company Limited, Vicarage Lane, Ilford, Essex
(72) Inventor
T. I. Silvey
(74) Agent
G. H. Jones

(54) **Hydrodynamic Devices**

(57) A hydrodynamic device 2 comprising first and second parts 4, 6 which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrofoil elements 10, and (b) towing means 14 for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

FIG. 2.



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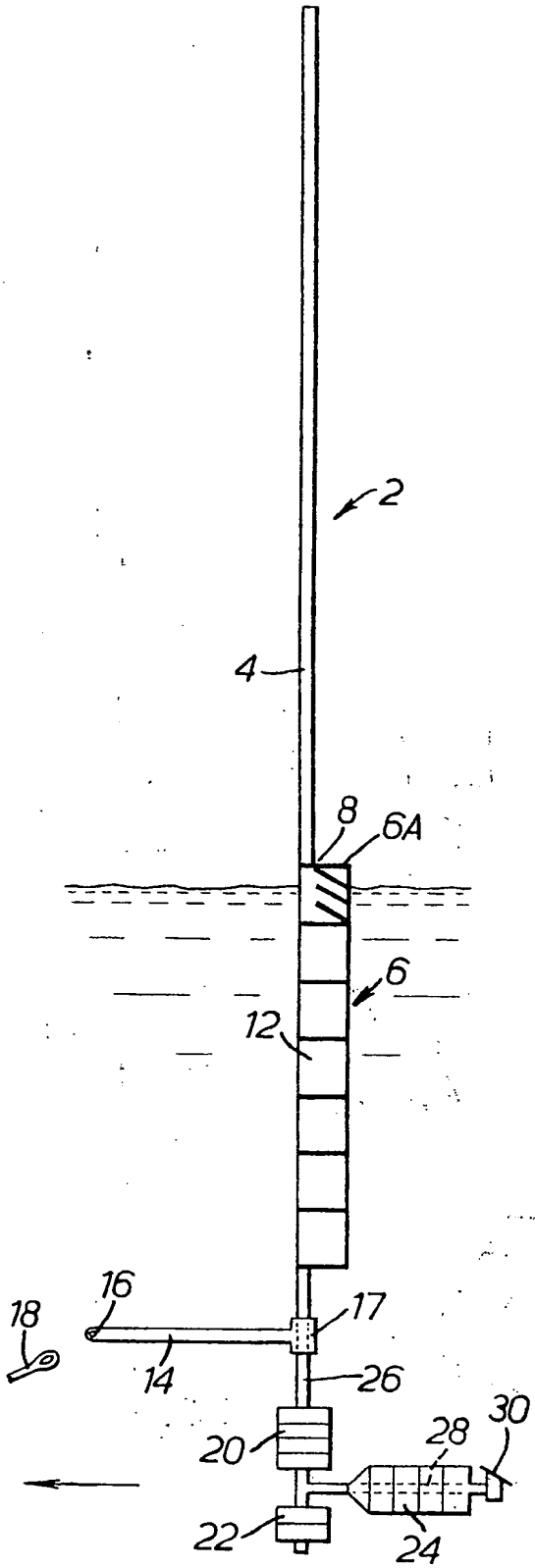


FIG. 1.

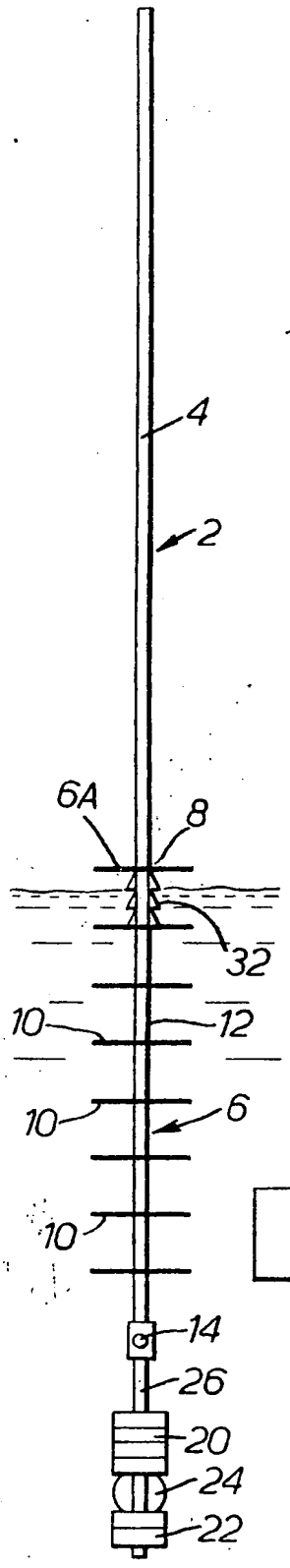


FIG. 2.



FIG. 4.

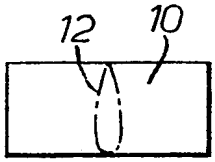


FIG. 3.

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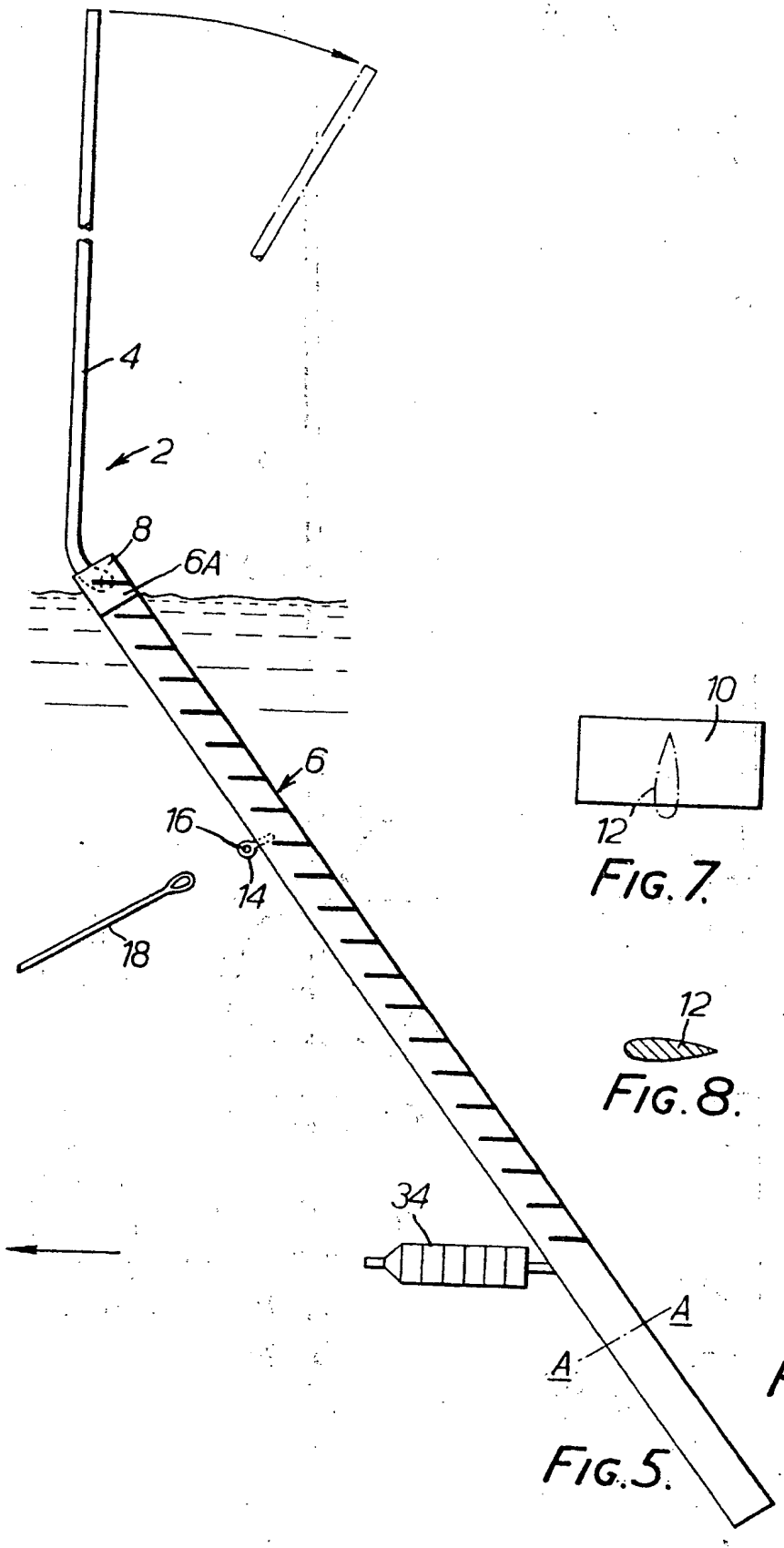


FIG. 5.

FIG. 7.

FIG. 8.

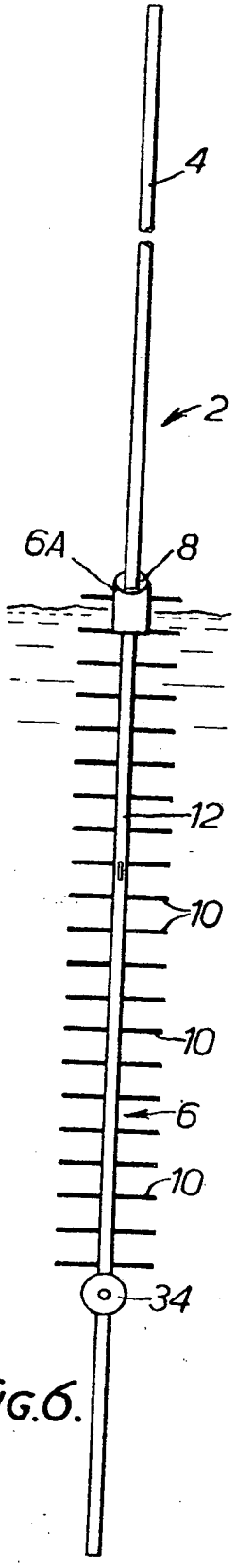


FIG. 6.

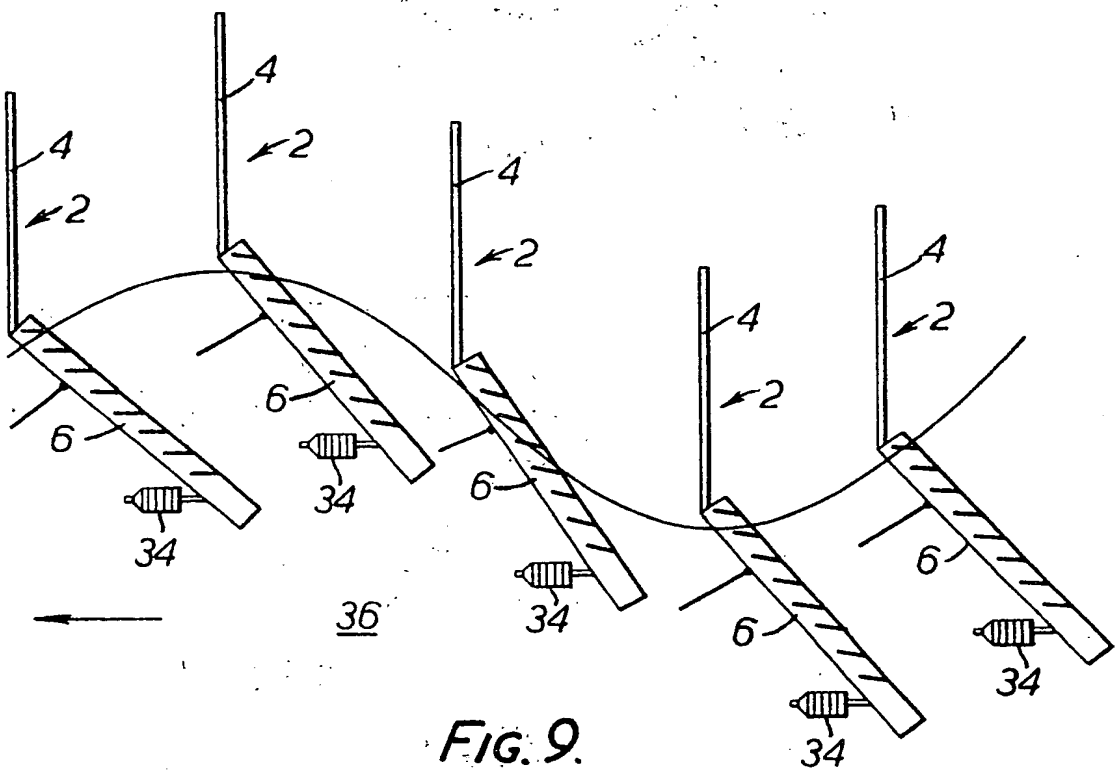


FIG. 9.

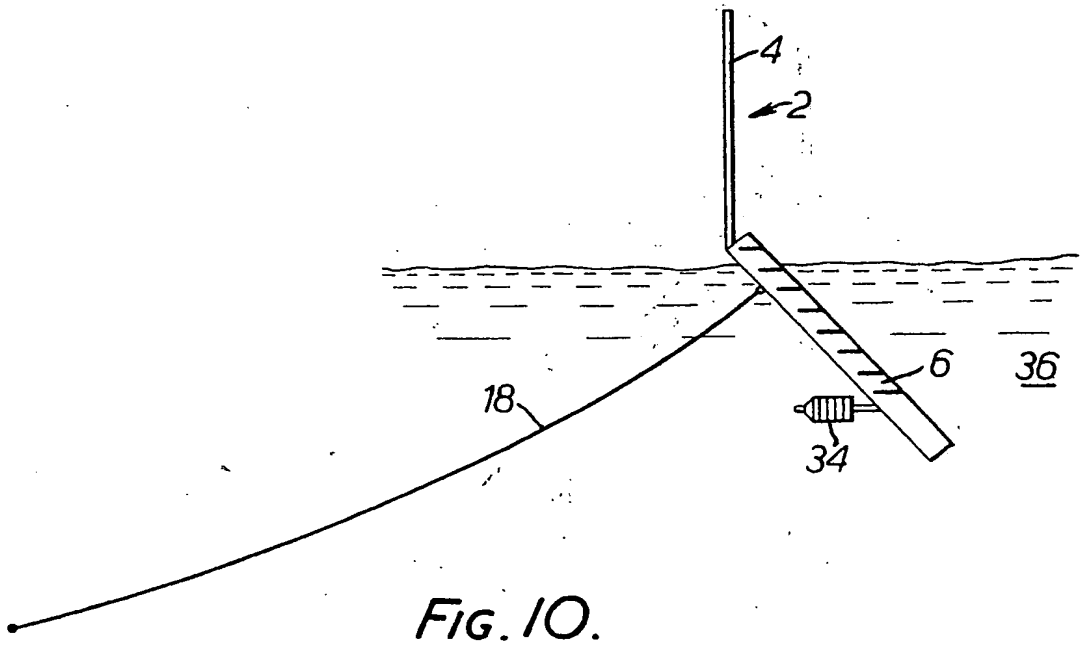


FIG. 10.

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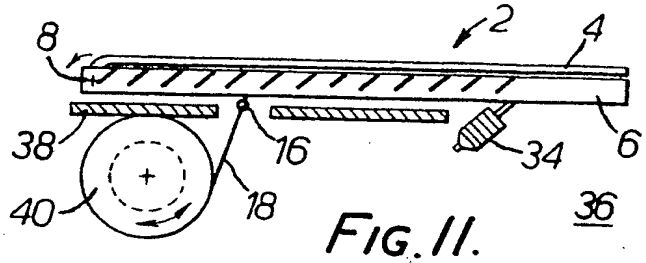


FIG. 11.

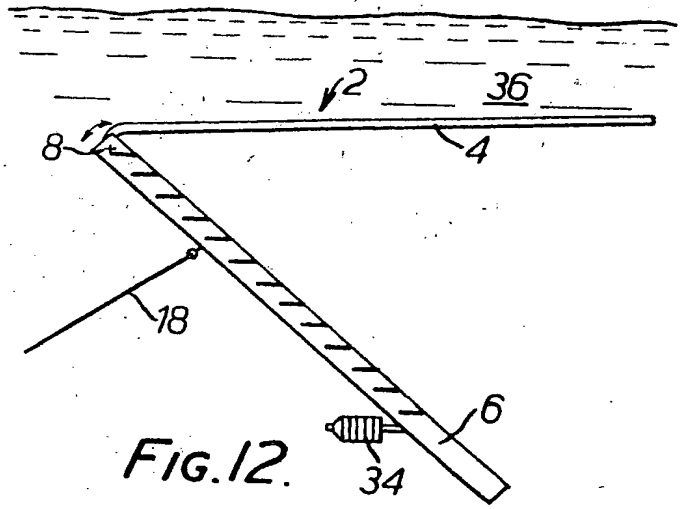


FIG. 12.

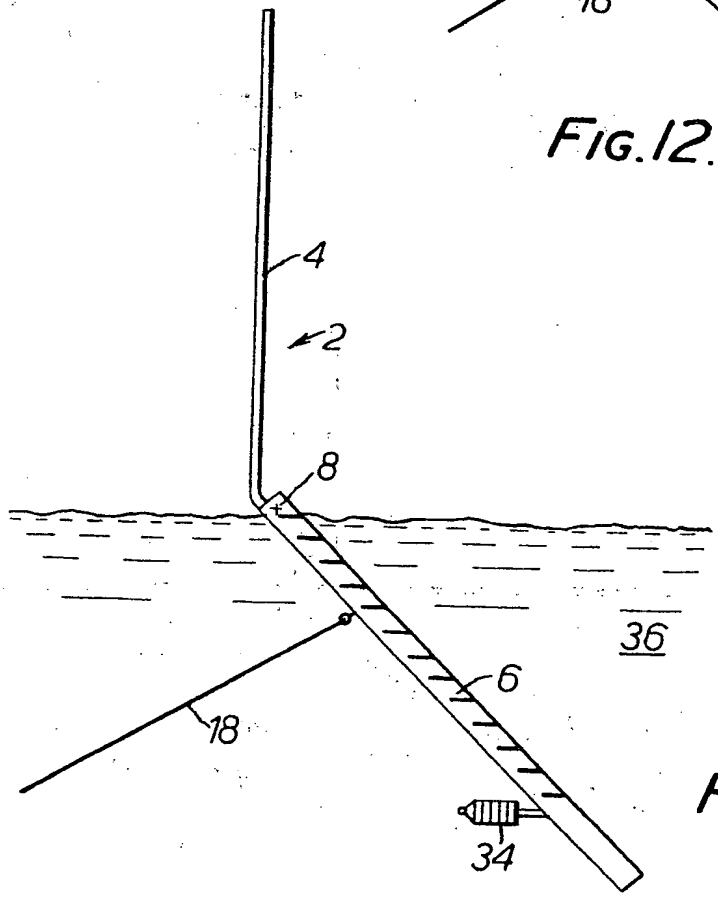


FIG. 13.

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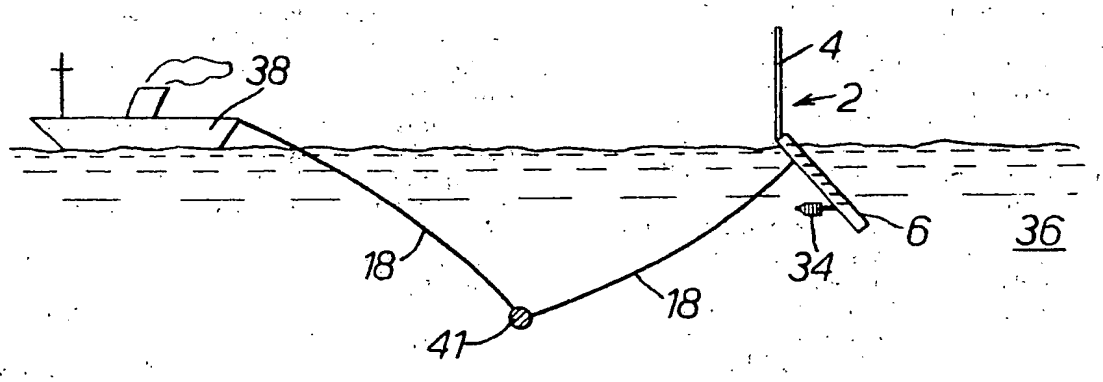


FIG. 14.

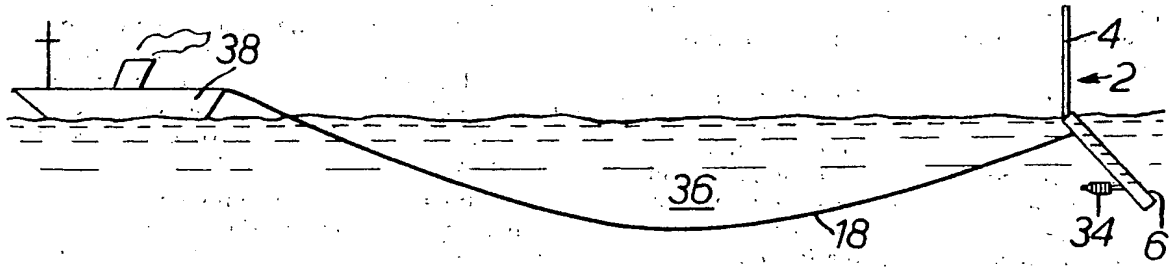


FIG. 15.

SPECIFICATION
Hydrodynamic Devices

This invention relates to a hydrodynamic device.

More specifically, this invention relates to a hydrodynamic device comprising first and second parts which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrofoil elements, and (b) towing means for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

The hydrodynamic device of the invention is designed so that it can be towed through the water without creating much wake. The hydrodynamic device is also designed to be vertically stable in use so that it can operate in high sea conditions. The device is non-buoyant in water and its characteristics are controlled by its second part which is thus hydrodynamically more important than its first part.

Preferably, the first and second parts are connected together by a sprung hinge arrangement. Such an arrangement allows the first part to easily and automatically move from its stored position to its upstanding operable position. Alternative arrangements for connecting the first and second parts together include a simple pivot whereby the first part can be moved from its stored position to its upstanding position merely by the use of appropriate hydrodynamic and aerodynamic vanes or by a counter balance weight system.

Advantageously, the first and second parts are so connected together that the first part lies substantially exactly flat. In order to achieve this, the precise arrangement by which the first and second parts are connected together may include auxiliary means such for example as a push rod which engages on a storage platform for getting the first part in the desired substantially flat condition.

Preferably, the hydrofoil elements are spaced apart by spacer elements.

The pair of hydrofoil elements that are uppermost when the device is being towed through the water may be provided with drag vanes for controlling the depth at which the second part is submerged. The drag vanes make the hydrodynamic device very sensitive to small depth variations.

Preferably, the towing means is a towing eye but it is to be appreciated that other devices can be employed.

The first part may be constituted by an aerial, a marker, a target or a radar reflector.

The hydrodynamic device may include weighting means, for example positioned on the end portion of the second part that is remote from the first part, for stabilizing the hydrodynamic device and for causing it to tow in a vertical or an inclided position.

Embodiments of the invention will now be described solely by way of example and with reference to the accompanying drawings in which:

Figure 1 is a side view of a first hydrodynamic device in accordance with the invention;

Figure 2 is an end view of the device shown in Figure 1;

Figures 3 and 4 show detailed parts of the device shown in Figure 1;

Figure 5 is a side view of a second hydrodynamic device in accordance with the invention;

Figure 6 is an end view of the device shown in Figure 5;

Figures 7 and 8 show detailed parts of the device shown in Figure 5;

Figures 9 and 10 show the device somewhat schematically as it is being towed through water;

Figure 11 shows the device of Figure 5 in a stowed position;

Figure 12 shows the device of Figure 5 in a partially open position;

Figure 13 shows the device of Figure 5 in its fully expanded position; and

Figures 14 and 15 show two methods of towing the hydrodynamic device illustrated in Figure 5.

Referring to Figures 1 to 4, there is shown a hydrodynamic device 2 comprising a first part 4 in the form of a flexible aerial, and a second part 6. The first and second parts 4, 6 are connected together by a hinge arrangement located at position 8, the hinge arrangement being such that the first part 4 is movable from a storage position in which it lies adjacent to the second part 6 to an operable position in which it upstands from and extends from an end portion 6A of the second part 6.

The second part 6 comprises an elongate member having a plurality of transversely extending hydrofoil elements 10 positioned on a shaped elongate fairing member 12 which reacts with the water flow in a manner which gives the device vertical stability. The second part 6 further comprises towing means in the form of a tow bar 14 for enabling a connection to be made between the hydrodynamic device 2 and a towing vessel (not shown) whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged. The tow bar 14 is provided at one end with a towing eye 16 for receiving a tow line 18 and at the other end a pivot 17 allowing freedom of rotation of the tow bar 14 about a shaft 26 in the elongate member.

Positioned beneath the tow bar 14 are a plurality of weights 20, 22, 24 which are attached to the shaft 26 and which are effective to balance the hydrodynamic device 2. Positioned aft of the

weight 24 and on a shaft 28 is a rectangular damper plate 30.

As shown most clearly in Figure 2, three drag vanes 32 are provided between the two uppermost hydrofoil elements 10. These drag vanes 32 are effective to control the depth at which the second part 6 is submerged. The drag vanes 32 make the hydrodynamic device 2 very sensitive to small depth variations, such that it can follow water surface wave profiles.

Referring now to Figures 5 to 8, similar parts as in Figures 1 to 4 have been given the same reference numeral and their construction and operation will not again be given in order to avoid undue repetition of description.

It will be noted that the hydrodynamic device 2 illustrated in Figures 5 to 8 has a smaller tow bar 14 than in the hydrodynamic device 2 illustrated in Figures 1 to 4 and that the tow bar pivot 17 is no longer required. Also, in the hydrodynamic device 2 illustrated in Figures 5 to 8, only a single weight 34 is employed and there are no drag vanes 32 or damper plate 30.

In Figure 9, there are shown a plurality of the hydrodynamic devices 2 illustrated in Figures 5 to 8, these devices 2 being illustrated as they follow the wave profile of the sea 36.

In Figure 10, the hydrodynamic device 2 is shown attached to a 50 foot tow line 18 and the depth of tow can vary from 0 to 20 feet. The speed of tow can vary, depending upon the structural strength of the device 2, from 3 to 20 knots for example.

In Figure 11, the hydrodynamic device 2 illustrated in Figures 5 to 8 is shown in its stored position in which the first part 4 is lying adjacent the second part 6. The second part 6 is in fact stored on a platform 38 and the tow line 18 is wound around a winch drum 40. As the cable 18 is unwound from the drum 40, then the hydrodynamic device 2 unfolds as illustrated in Figures 12 and 13, Figure 12 illustrating an intermediate unfolded position and Figure 13 illustrating the fully unfolded position. The platform 38 can be submerged so that the hydrodynamic device 2 can be launched substantially automatically from a submerged condition.

Referring now to Figures 14 and 15, the hydrodynamic device 2 illustrated in Figures 5 to 8 is shown being towed by a vessel 38. In Figure 14, a sinker or depressor device 40 is attached to the tow line 18 so that the device is much closer to the vessel in Figure 14 than in Figure 15 where the sinker or depressor device 41 is not employed.

It is to be appreciated that the embodiments of the invention described above have been given by way of example only and that modifications may be effected. Thus, for example, the weighting arrangements 20, 22, 24 or 34 can be built into the second part 6 to form a part of the second part 6. Also, the first part 4 of the hydrodynamic device 2 has been illustrated as a flexible aerial but this first part 4 of the hydrodynamic device 2 could also be a marker device, a target or a radar reflector. Also, different types of hinge 8 can be employed. If the first part 4 is small than a rigid attachment to part 6 such that it becomes merely an extension to the top of the main part 6 could be envisaged.

Claims

1. A hydrodynamic device comprising first and second parts which are connected together such that the first part is movable from a storage position in which it lies adjacent to the second part to an operable position in which it upstands from and extends from one end portion of the second part, the second part comprising an elongate member having (a) a plurality of transversely extending hydrfoil elements, and (b) towing means for enabling a connection to be made between the hydrodynamic device and a towing vessel whereby the hydrodynamic device can be towed in water with the first part visible above the water and the second part submerged.

2. A hydrodynamic device according to claim 1 in which the first and second parts are connected together by a sprung hinge arrangement.

3. A hydrodynamic device according to claim 1 or claim 2 in which the first and second parts are so connected together that the first part lies substantially exactly flat.

4. A hydrodynamic device according to any one of the preceding claims in which the hydrofoil elements are spaced apart by spacer elements.

5. A hydrodynamic device according to any one of the preceding claims in which the pair of hydrofoil elements that are uppermost when the device is being towed through the water are provided with drag vanes for controlling the depth at which the second part is submerged.

6. A hydrodynamic device according to any one of the preceding claims in which the towing means is a towing eye.

7. A hydrodynamic device according to any one of the preceding claims including weighting means for stabilizing the hydrodynamic device and for causing it to tow in a vertical or an inclined position.

8. A hydrodynamic device according to claim 7 in which the weighting means is positioned on the end portion of the second part that is remote from the first part.

9. A hydrodynamic device substantially as herein described with reference to the accompanying drawings.

New claims or amendments to claims filed on 28/8/79.

Superseded claims 1.

New or Amended Claims:—1

"hydrfoil" on line 9 of claim 1 should read "hydrofoil"

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.